

**REMARKS**

Claims 1-8 are pending in this application. Claims 1, 4 and 6 have been amended.

The abstract of the disclosure has been rewritten as suggested by the Office Action. The commas in the numerals in Tables 1-4 have been changed to decimal points. The specification of the application has been amended to include a brief description of Fig. 1. Applicant points out that the elements of Fig. 1 are described in more detail on page 6, lines 30-31, and page 7, lines 1-10, of the application. No new matter has been introduced.

Claims 1 and 6 stand objected to because of informalities. In particular, in lines 6 and 11 of claim 1, the Examiner notes that "it appears that the word 'in' should be changed to 'for'" and, in line 2 of claim 6, "the second occurrence of the word 'step' is unnecessary." (Office Action at 2-3). Claims 1 and 6 have been amended to correct these informalities.

Claims 1-8 stand rejected under 35 U.S.C. § 112, second paragraph, "as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." (Office Action at 3). In particular, the Examiner asserts that "[c]laims 1-8 are indefinite because the expression 'obtaining a hydrotreated effluent *with* the hydrotreated feed stock, hydrogen sulphide, and hydrogen' appears to be incorrect." (Office Action at 3). In addition, claim 4 is asserted by the Examiner to be indefinite "because the expression 'the hydrotreating step' lacks proper antecedent basis in claim 1." (Office Action at 3). Claims 1 and 4 have been amended to correct any perceived indefiniteness. Applicant notes that all pending claims are now in full compliance with 35 U.S.C. § 112.

Claims 1-3 and 6-8 stand rejected under 35 U.S.C. § 102 as being anticipated by Okazaki et al. (U.S. Patent No. 6,264,827) ("Okazaki"). This rejection is respectfully traversed.

The claimed invention relates to a process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock. As such, amended independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Amended independent claim 1 also recites "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds."

Okazaki relates to a "manufacturing process of a diesel oil with a high cetane number and a low sulfur." (Abstract). Okazaki teaches that the cetane number is improved "by the ring opening with hydrogenation of the petroleum distillate oil and lowering of the sulfur content by hydrodesulfurization." (Col. 2, lines 48-52). Okazaki emphasizes that "unstable substances with polycyclic aromatic structures . . . which make worse the storage stability are removed." (Col. 2, lines 52-55). This is because "[t]he unstable substances with specific polycyclic aromatic structures make the hue of the hydrogenated oil worse and generate sludge." (Col. 2, lines 55-57).

Okazaki does not disclose all limitations of claims 1-3 and 6-8. Okazaki fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective *for conversion of polyaromatic hydrocarbons to monoaromatic compounds*," as amended independent claim 1 recites (emphasis added). Okazaki teaches improving the cetane number "by the ring opening with hydrogenation of the petroleum distillate oil" and lowering of the sulfur content by hydrodesulfurization. (Col. 2, lines 48-52). Thus, Okazaki teaches ring

opening of the petroleum distillate oil and the formation of aliphatic non-cyclic compounds which are *non-aromatic compounds*, and not “*conversion of polyaromatic hydrocarbons to monoaromatic compounds*,” as amended independent claim 1 recites (emphasis added). For at least these reasons, Okazaki fails to teach or disclose all limitations of amended independent claim 1, and withdrawal of the rejection of claims 1-3 and 6-8 is respectfully requested.

Claim 4 stands rejected under 35 U.S.C. § 103 as being unpatentable over Okazaki in view of Inwood (US Patent No. 3,691,060). This rejection is respectfully traversed.

Amended claim 4 depends on amended independent claim 1 and recites that the step of “contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds” is “performed in a final catalyst bed of the hydrotreating zone.”

Inwood relates to a method of “hydrogenation of aromatic hydrocarbons.” (Abstract; Title). Inwood teaches that “[a]romatic hydrocarbon feedstock containing organic sulfur compounds are hydrogenated in a ‘single-stage’ process, utilizing a dual-catalyst hydrogenation system.” (Abstract). In this manner, “[t]he feed is first hydrofined over a sulfactive catalyst . . . and total effluent is then hydrogenated over a sulfur-sensitive Group VIII noble metal hydrogenation catalyst.” (Abstract).

The subject matter of amended claim 4 would not have been obvious over Okazaki in view of Inwood. The Office Action fails to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, three requirements must be met: (1) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine reference teachings; (2) a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations. More importantly, the teaching or suggestion to make the claimed combination and the

reasonable expectation for success must both be found in the prior art and not based on Applicant's disclosure. See, e.g., In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

Okazaki and Inwood, whether considered alone or in combination, fail to teach or suggest all limitations of amended independent claim 1. As noted above, Okazaki fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective *for conversion of polyaromatic hydrocarbons to monoaromatic compounds*," as amended independent claim 1 recites (emphasis added).

Similarly, Inwood fails to teach or suggest the sequence of steps recited in amended independent claim 1. Inwood does not teach or suggest "contacting the feed stock with hydrogen over a hydrotreating catalyst . . . and obtaining a hydrotreated effluent," "cooling the hydrotreated effluent" and "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as amended independent claim 1 recites. Inwood teaches that the first step requires "hydrofining conditions and catalysts" and that the second step requires "hydrogenation conditions and catalysts," without an intermediary cooling step. (Col. 3, lines 33-75; Col. 4, lines 1-20). For at least these reasons, the Office Action fails to establish a *prima facie* case of obviousness and withdrawal of the rejection of claim 4 is respectfully requested.

Claim 5 stands rejected under 35 U.S.C. § 103 as being unpatentable over Okazaki. This rejection is respectfully traversed.

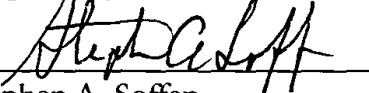
Claim 5 depends on amended independent claim 1 and recites that "the feedstock is characterized by having a 50% boiling point between 300°C and 450°C." As noted above, Okazaki fails to teach or suggest all limitations of amended independent claim 1. Accordingly, withdrawal of the rejection of claim 5 is respectfully requested.

A marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made to claims" and "Version with markings to show changes made to paragraphs."

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS**

1. (Amended) A process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock having a boiling range between 200°C and 600°C, which process comprises the steps of:

(a) contacting the feed stock with hydrogen over a hydrotreating catalyst in a hydrotreating zone at conditions being effective [in] for hydrotreating and obtaining [an] a hydrotreated effluent [with the] comprising hydrotreated feed stock, hydrogen sulphide and hydrogen[,];

(b) cooling the hydrotreated effluent[,]; and

(c) contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective [in hydrogenation] for conversion of polyaromatic hydrocarbons to monoaromatic compounds.

4. (Amended) A process of claim 1, wherein step (c) is performed in a final catalyst bed of the hydrotreating [step] zone.

6. (Amended) A process of claim 1, wherein the hydrotreating catalyst used in step (c) [step] is a composite of Group VI-B and/or Group VIII metal on a porous refractory inorganic oxide.

**VERSION WITH MARKINGS TO SHOW CHANGES MADE TO  
PARAGRAPHS**

On page 9, lines 19-23:

(Amended)

**Table 1**

Properties of feedstock used in the following Examples:

<b>Properties</b>	<b>Feedstock A</b>	<b>Feedstock B</b>
SG 60/60	[0,9279] <u>0.9279</u>	[0,9924] <u>0.9924</u>
S (wt %)	[1,34] <u>1.34</u>	[3,53] <u>3.53</u>
N (wt ppm)	2677	3594
Aromatics (wt%)		
Mono-	[17,7] <u>17.7</u>	[8,36] <u>8.36</u>
Di-	[9,9] <u>9.9</u>	[7,29] <u>7.29</u>
Tri-	[11,4] <u>11.4</u>	[36,5] <u>36.5</u>

On page 10, lines 1-5:

(Amended)

**Table 2**

Properties of products in Example 1:

Properties	Product A	Product B
SG 60/60	[0,8920] 0,8920	[0,9411] 0,9411
S (wt %)	[0,02] 0,02	[0,1905] 0,1905
N (wt ppm)	526	2046
Aromatics (wt%)		
Mono-	[31,0] 31,0	[22,6] 22,6
Di-	[7,8] 7,8	[11,3] 11,3
Tri-	[6,7] 6,7	[23,9] 23,9
Distillation, D2887 (°C)		
5	236	287
10	267	314
30	342	360
50	392	392
70	437	428
90	495	479
95	518	503

On page 11, lines 3-10:

(Amended)

**Table 3[.]**

Properties of products in Example 2:

Tem- perature (°C)	LHSV (h <sup>-1</sup> )	SG 60/60	S (wt%)	N (wt ppm)	Di- aromatics (wt%)	Tri- aromatics (wt%)	PAH (wt%)
325	6	[0,8914] <u>0.8914</u>	[0,0038] <u>0.0038</u>	505	[4,6] <u>4.6</u>	[5,0] <u>5.0</u>	[9,6] <u>9.6</u>
350	6	[0,8911] <u>0.8911</u>	[0,0029] <u>0.0029</u>	468	[4,9] <u>4.9</u>	[4,9] <u>4.9</u>	[9,5] <u>9.5</u>

On page 12, lines 1-5:

(Amended)

**Table 4**

Properties of products in Example 3:

Tem- perature (°C)	LHSV (h <sup>-1</sup> )	SG 60/60	S (wt%)	N (wt ppm)	Di- aromatics (wt%)	Tri- aromatics (wt%)	PAH (wt%)
300	2	[0,9369] <u>0.9369</u>	[0,1500] <u>0.1500</u>	2058	[7,7] <u>7.7</u>	[20,1] <u>20.1</u>	[27,8] <u>27.8</u>
300	4	[0,9390] <u>0.9390</u>	[0,1588] <u>0.1588</u>	2067	[10,2] <u>10.2</u>	[21,3] <u>21.3</u>	[31,5] <u>31.5</u>
300	6	[0,9406] <u>0.9406</u>	[0,1618] <u>0.1618</u>	2080	[9,9] <u>9.9</u>	[21,4] <u>21.4</u>	[31,6] <u>31.6</u>
350	2	[0,9335] <u>0.9335</u>	[0,1049] <u>0.1049</u>	1657	[6,6] <u>6.6</u>	[17,0] <u>17.0</u>	[23,6] <u>23.6</u>
350	4	[0,9365] <u>0.9365</u>	[0,1317] <u>0.1317</u>	1870	[9,2] <u>9.2</u>	[18,1] <u>18.1</u>	[27,3] <u>27.3</u>
350	6	[0,9378] <u>0.9378</u>	[0,1442] <u>0.1442</u>	1877	[9,6] <u>9.6</u>	[19,3] <u>19.3</u>	[28,9] <u>28.9</u>

On page 15, lines 3-12, please amend the abstract of the disclosure as follows:

(Amended) A process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed having a boiling range between 200°C and 600°C ~~is disclosed. The~~ [, which] process comprises in combination contacting the feed and hydrogen over a hydrotreating catalyst and hydrotreating feed at hydrotreating conditions, cooling the hydrotreated effluent and hydrogen-rich gas from the hydrotreating reactor ~~and~~ contacting [said] ~~the~~ effluent and hydrogen gas over a hydrotreating catalyst in a post-pretreatment reactor at a temperature sufficient to lower the polyaromatic hydrocarbon content.